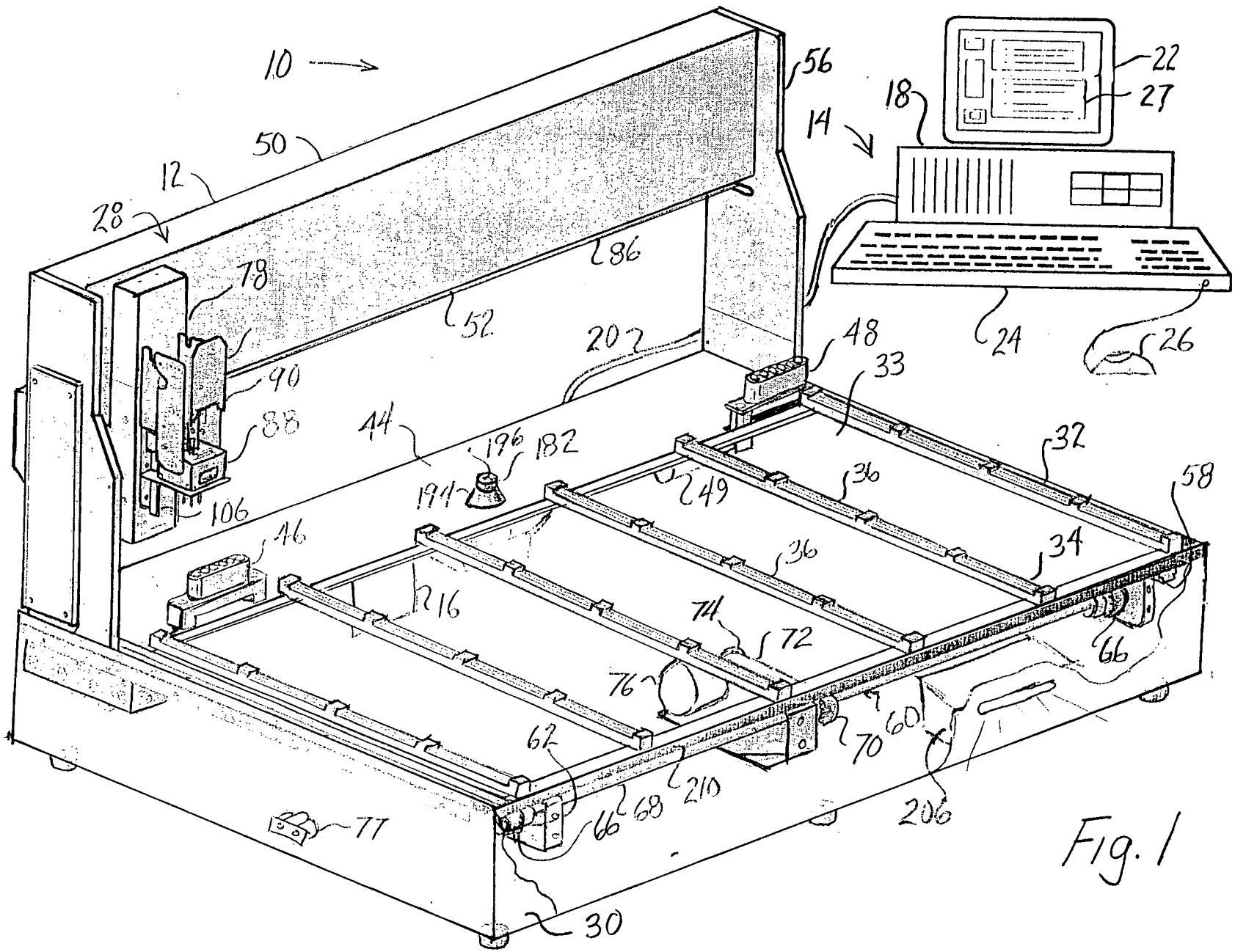
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Fig. 1

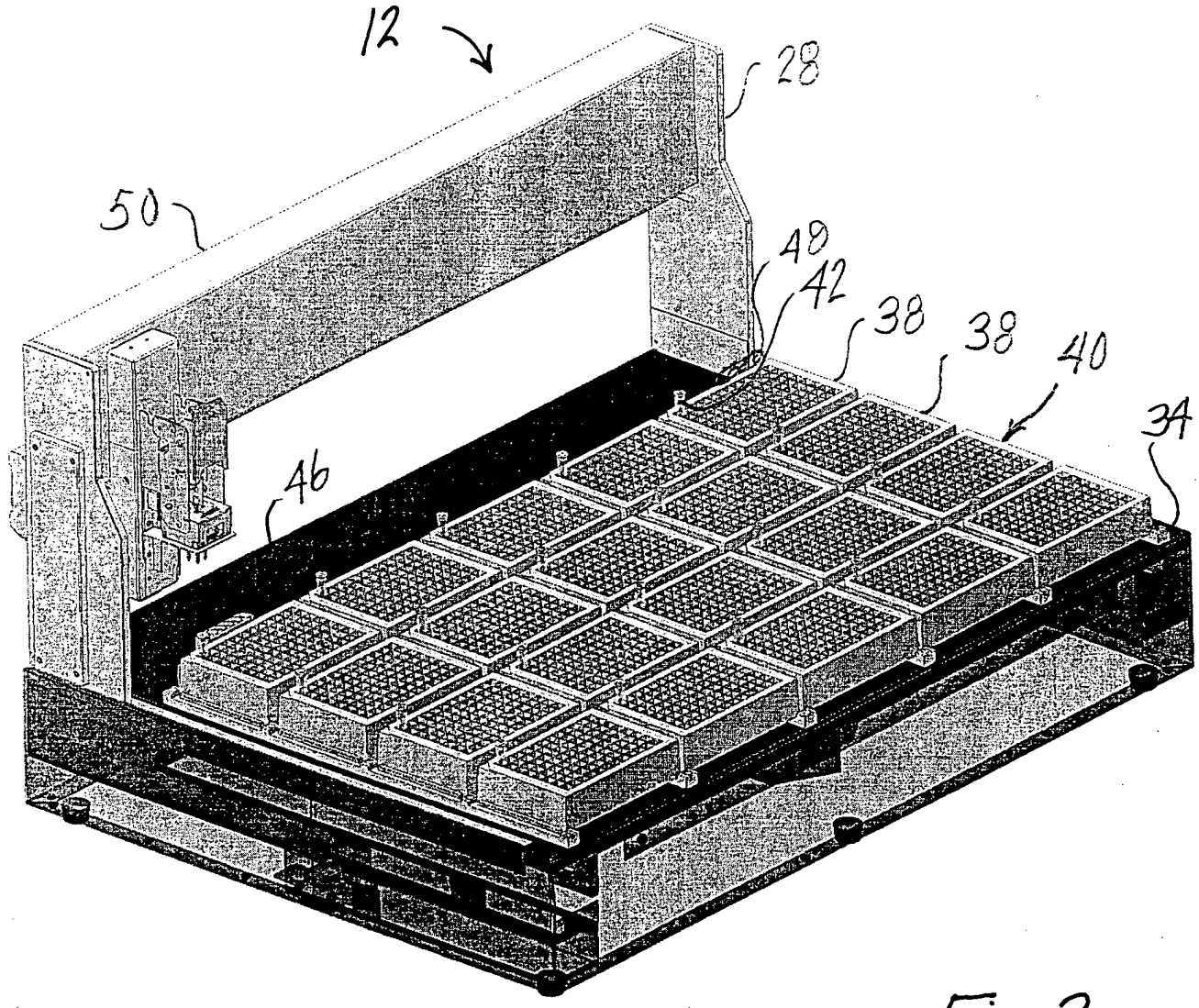

Fig. 2

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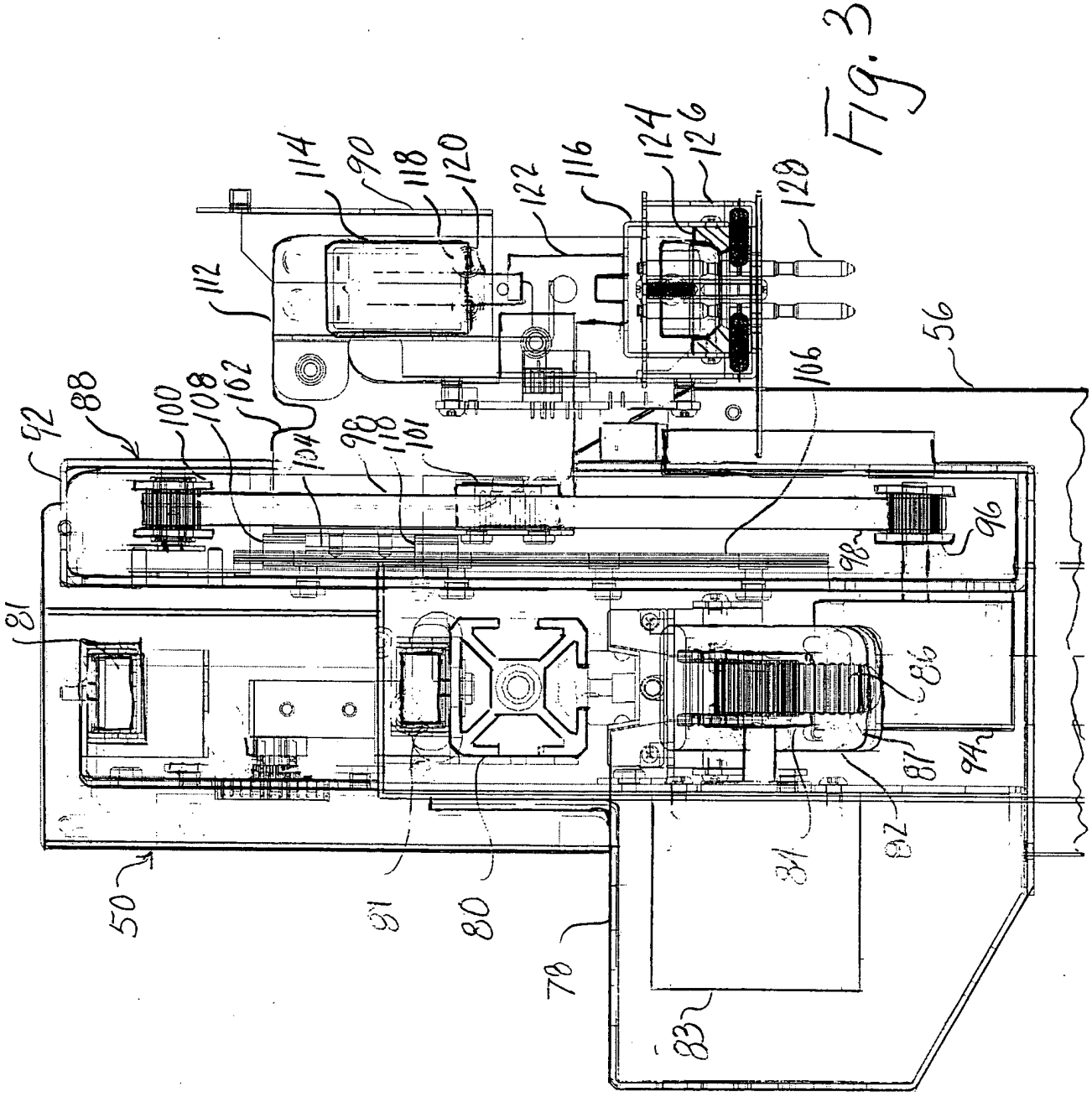
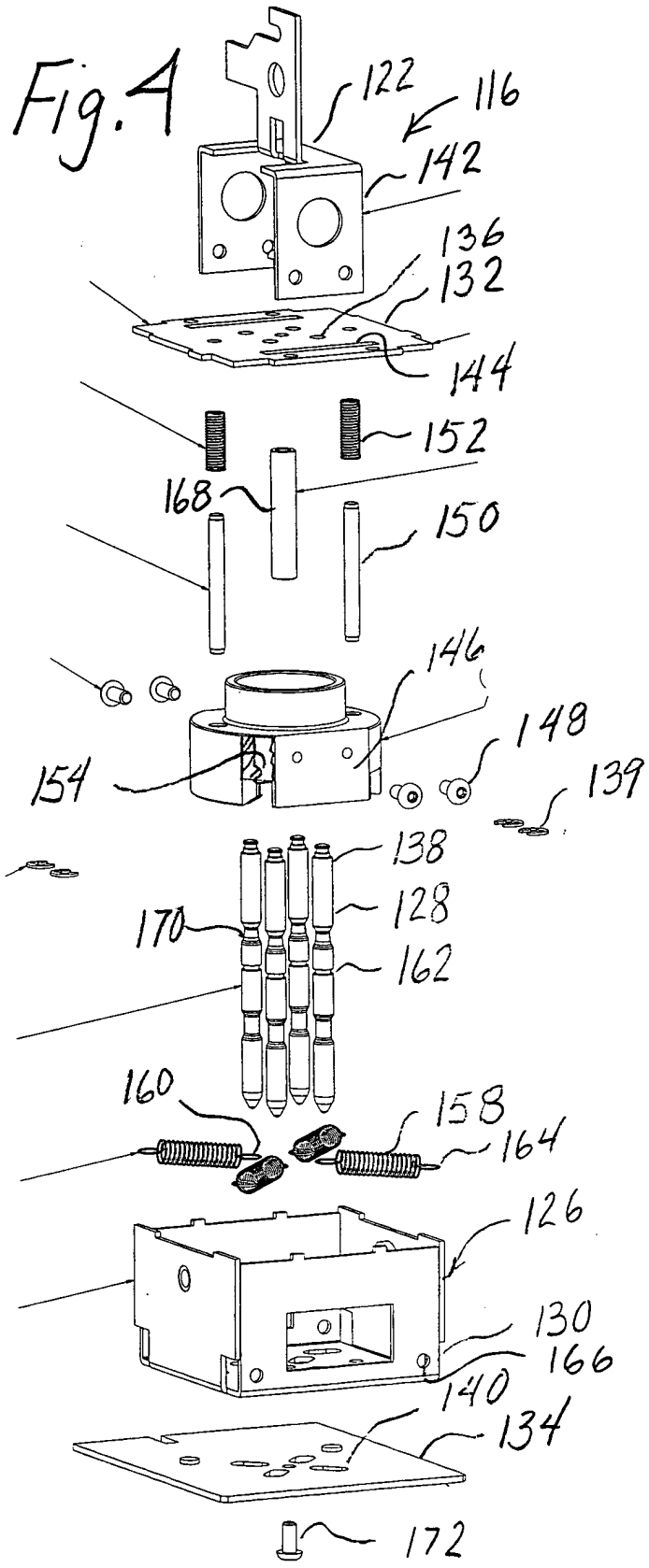


Fig. 3

BEST AVAILABLE COPY

Fig. 4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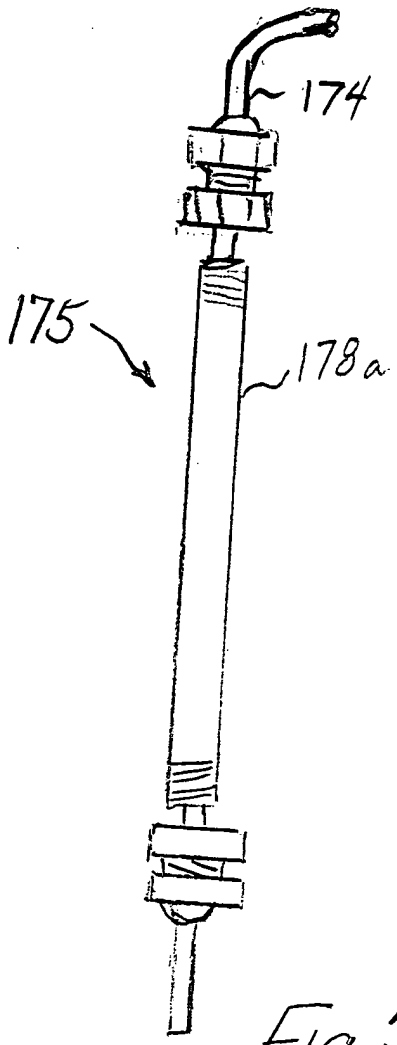

174
175
178a

Fig. 5

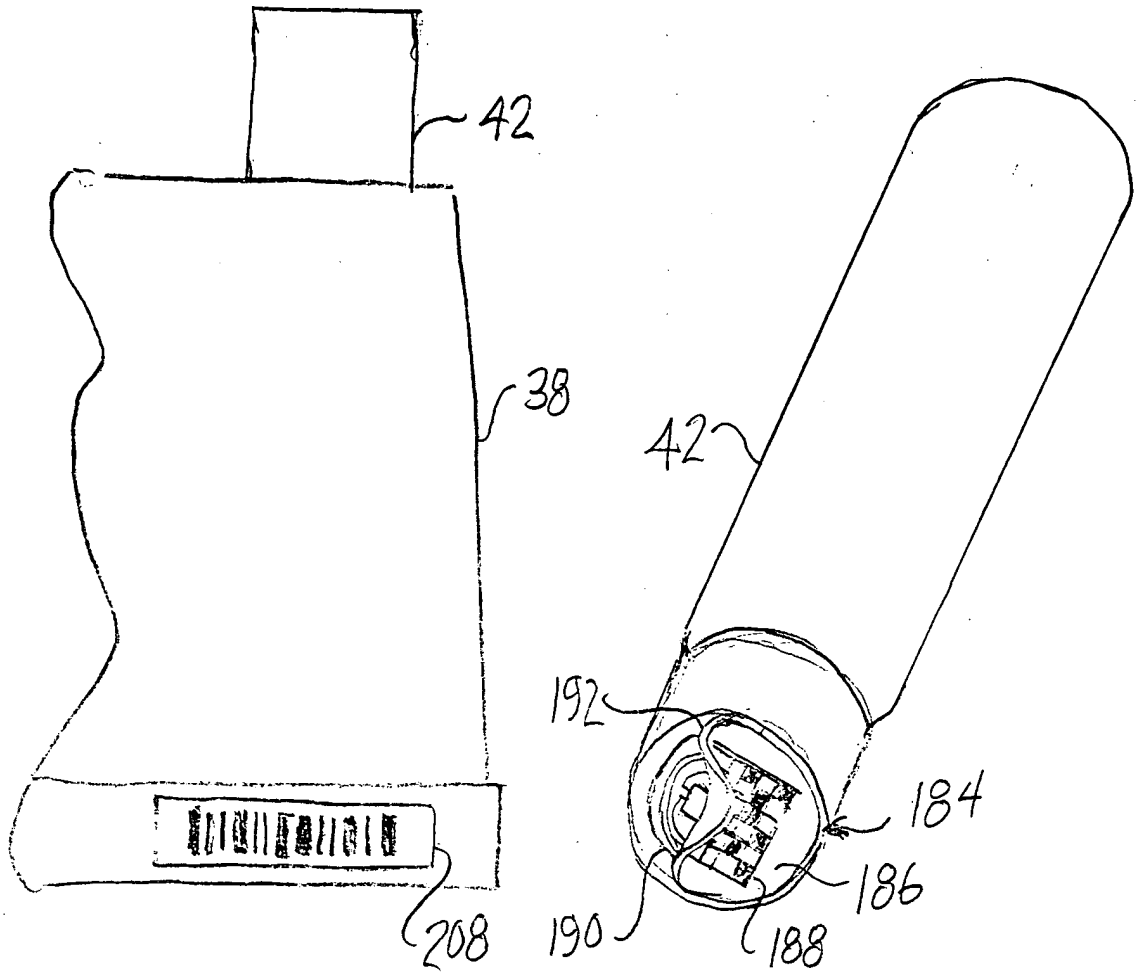


Fig. 6

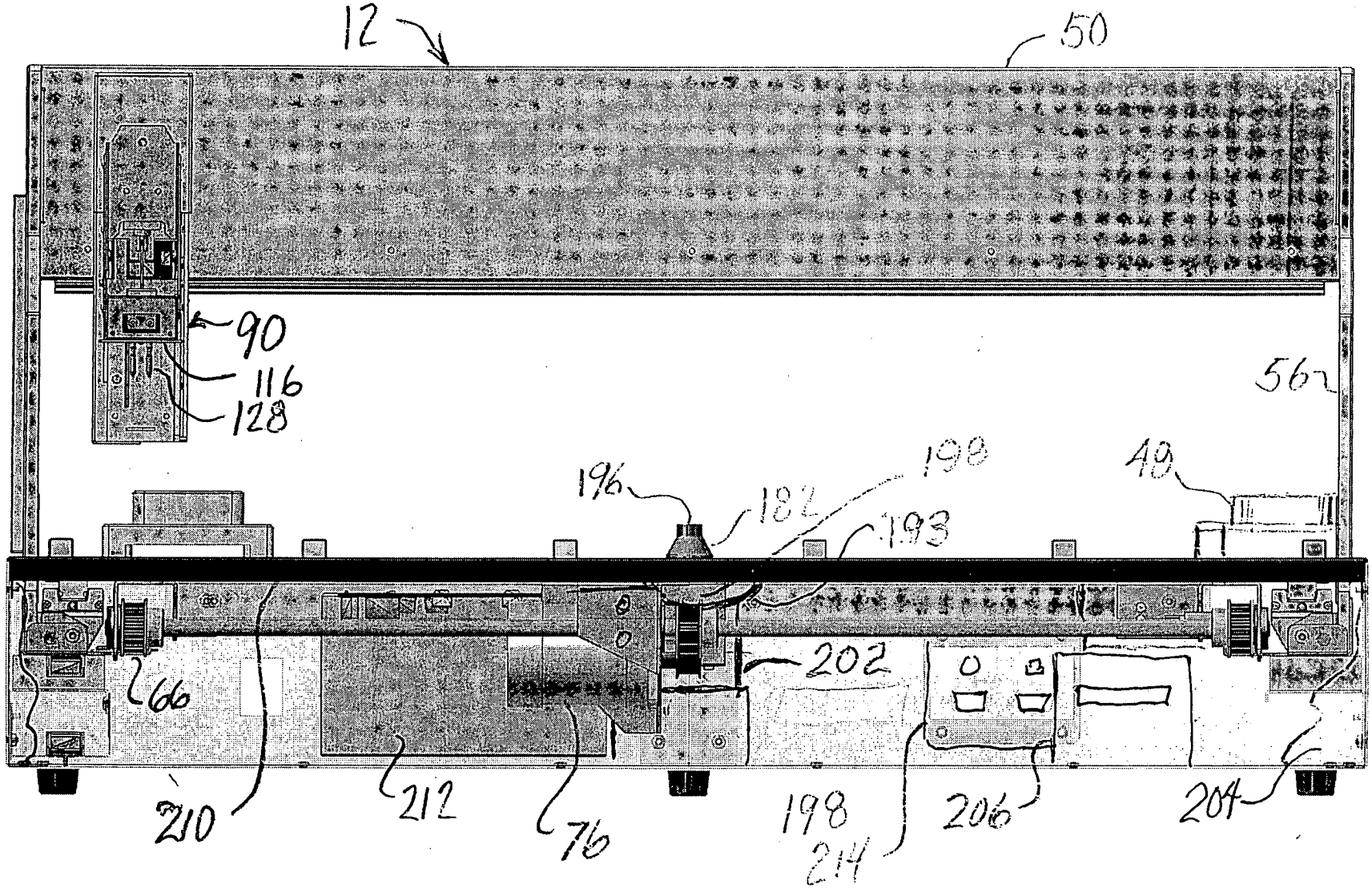


Fig. 7

BEST AVAILABLE COPY

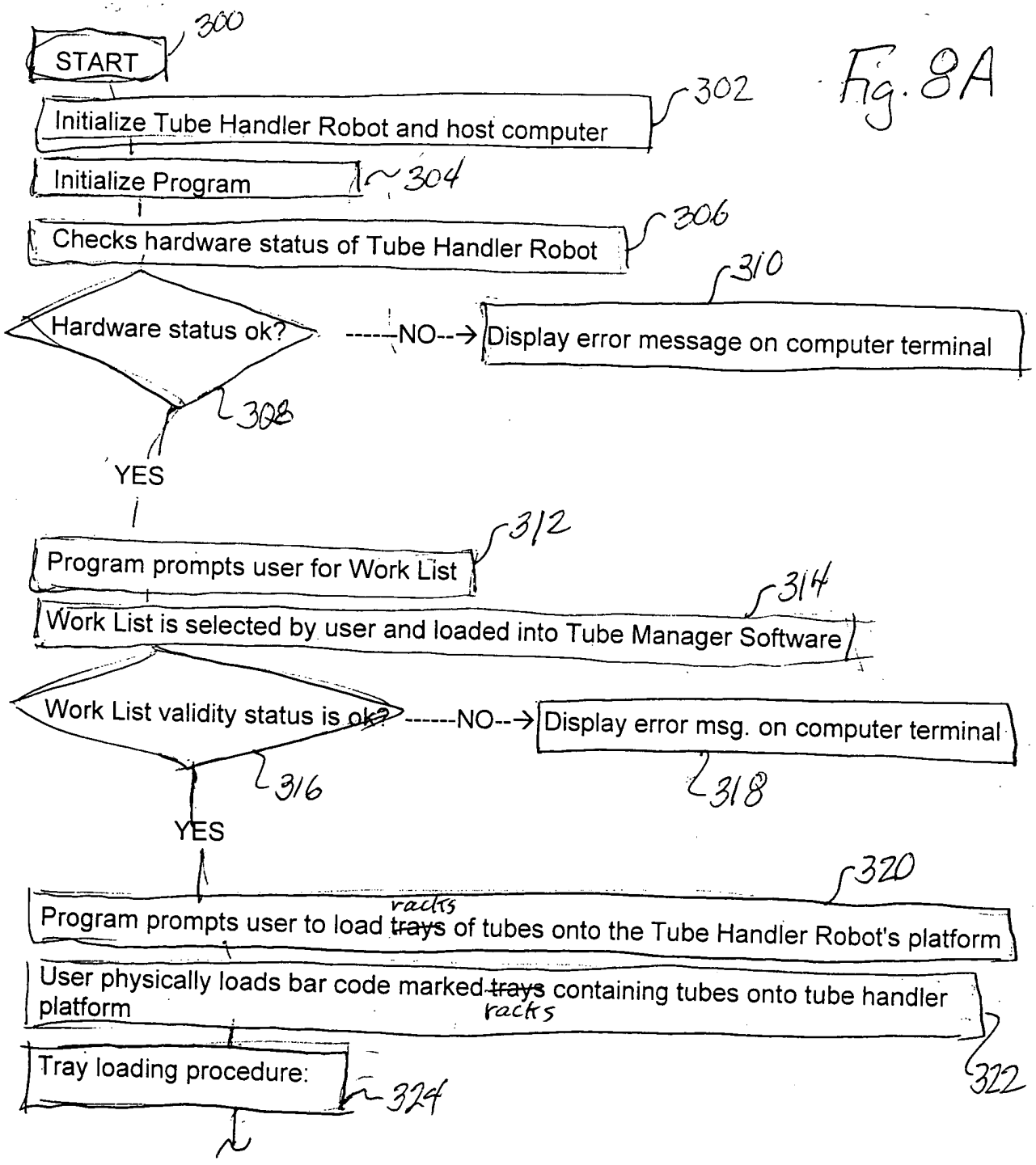

START
300
Initialize Tube Handler Robot and host computer
302
Initialize Program
304
Checks hardware status of Tube Handler Robot
306
Hardware status ok?
308
NO
Display error message on computer terminal
310
YES
Program prompts user for Work List
312
Work List is selected by user and loaded into Tube Manager Software
314
Work List validity status is ok?
316
NO
Display error msg. on computer terminal
318
YES
Program prompts user to load ~~trays~~ racks of tubes onto the Tube Handler Robot's platform
320
User physically loads bar code marked ~~trays~~ racks containing tubes onto tube handler platform
322
Tray loading procedure:
324

Fig. 8A

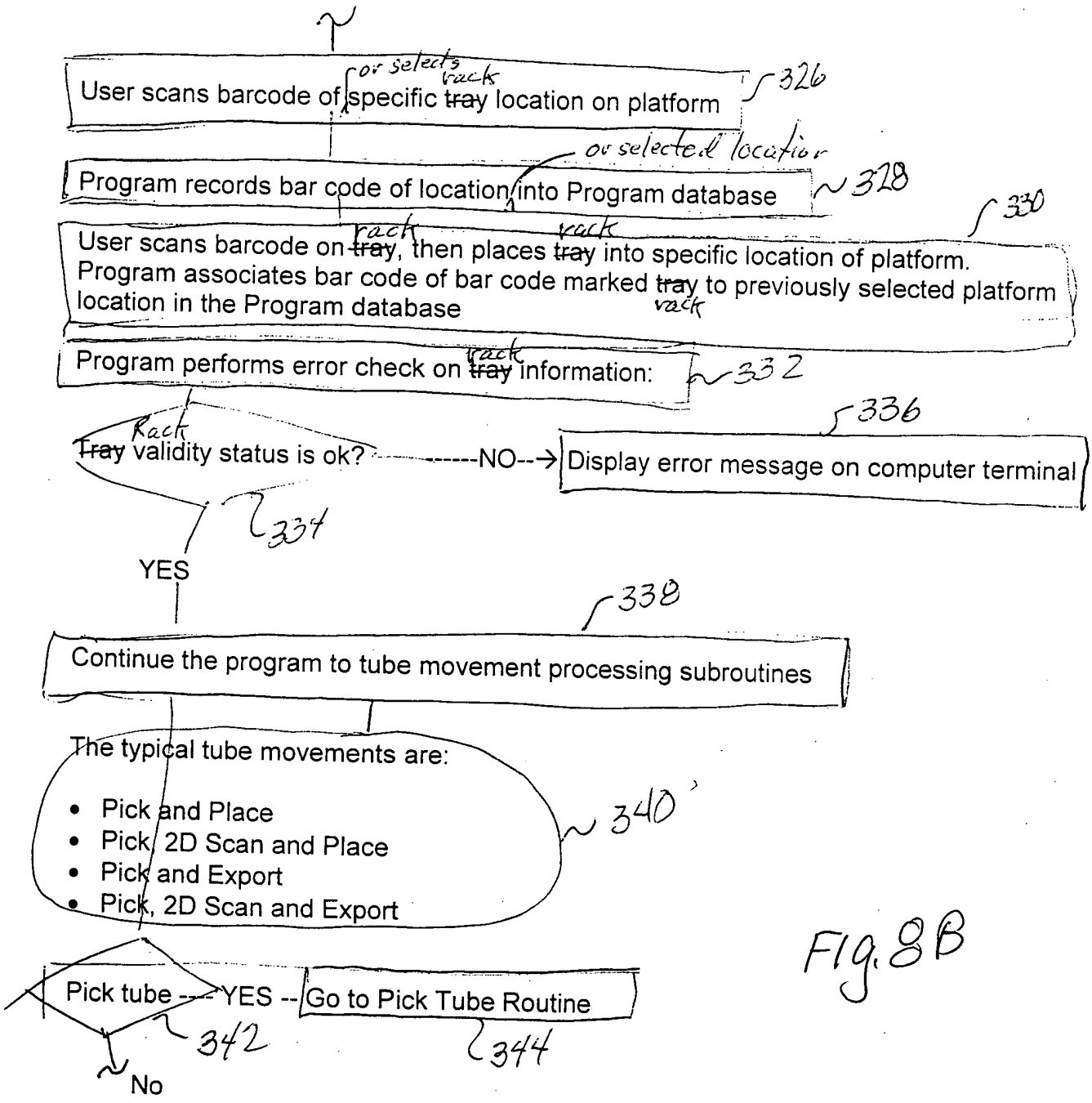

User scans barcode of specific ~~tray~~ or selects rack location on platform
326
Program records bar code of location into Program database or selected location
328
User scans barcode on ~~tray~~ rack, then places ~~tray~~ rack into specific location of platform. Program associates bar code of bar code marked ~~tray~~ rack to previously selected platform location in the Program database
330
Program performs error check on ~~tray~~ rack information:
332
~~Tray~~ Rack validity status is ok?
NO
Display error message on computer terminal
336
334
YES
Continue the program to tube movement processing subroutines
338
The typical tube movements are:
• Pick and Place
• Pick, 2D Scan and Place
• Pick and Export
• Pick, 2D Scan and Export
340
Pick tube
YES
Go to Pick Tube Routine
342
344
No

Fig. 8B

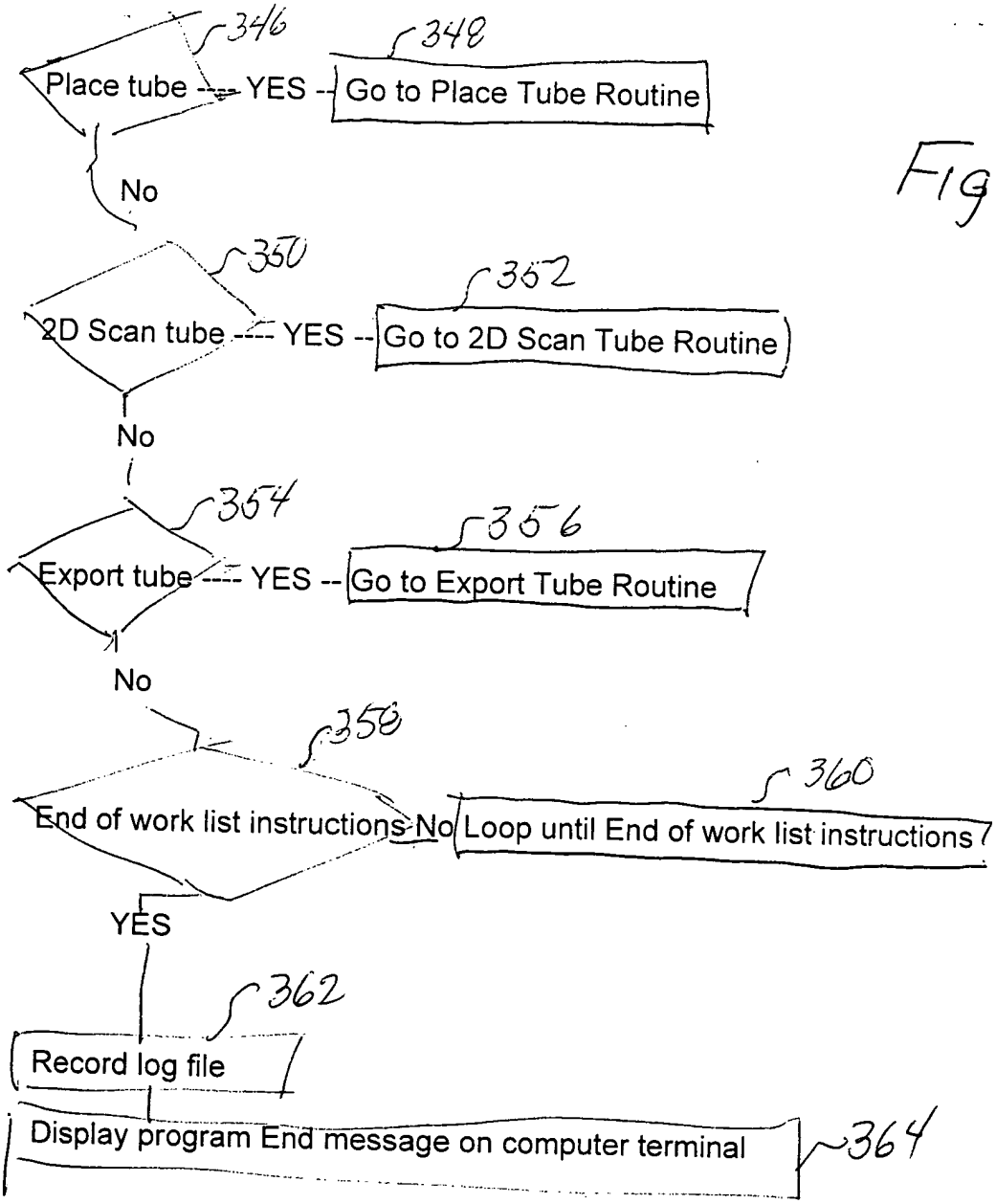

346
Place tube
YES
348
Go to Place Tube Routine
No
350
2D Scan tube
YES
352
Go to 2D Scan Tube Routine
No
354
Export tube
YES
356
Go to Export Tube Routine
No
358
End of work list instructions
No
360
Loop until End of work list instructions?
YES
362
Record log file
Display program End message on computer terminal
364

Fig 8C

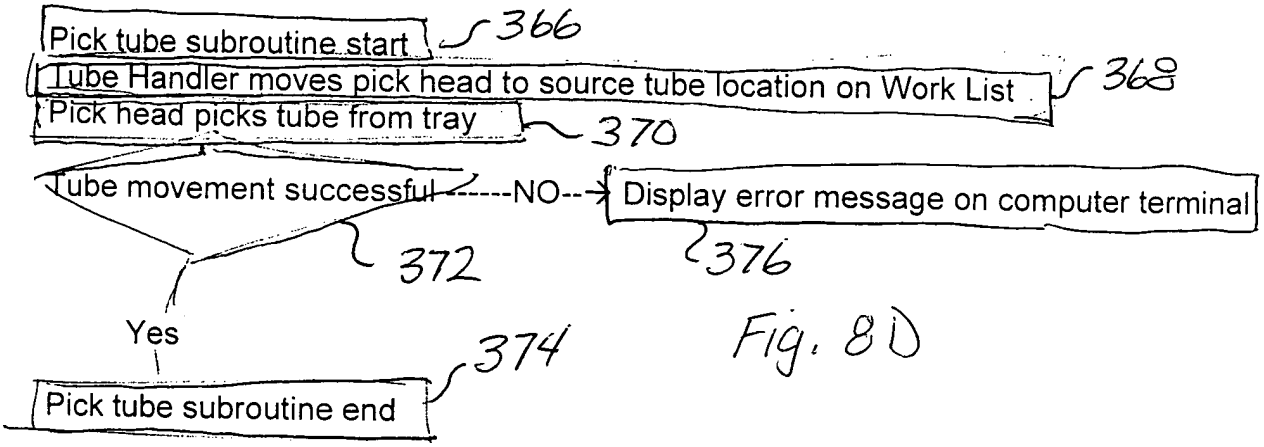

Pick tube subroutine start
366
Tube Handler moves pick head to source tube location on Work List
368
Pick head picks tube from tray
370
Tube movement successful
NO
Display error message on computer terminal
372
376
Yes
374
Pick tube subroutine end

Fig. 8D

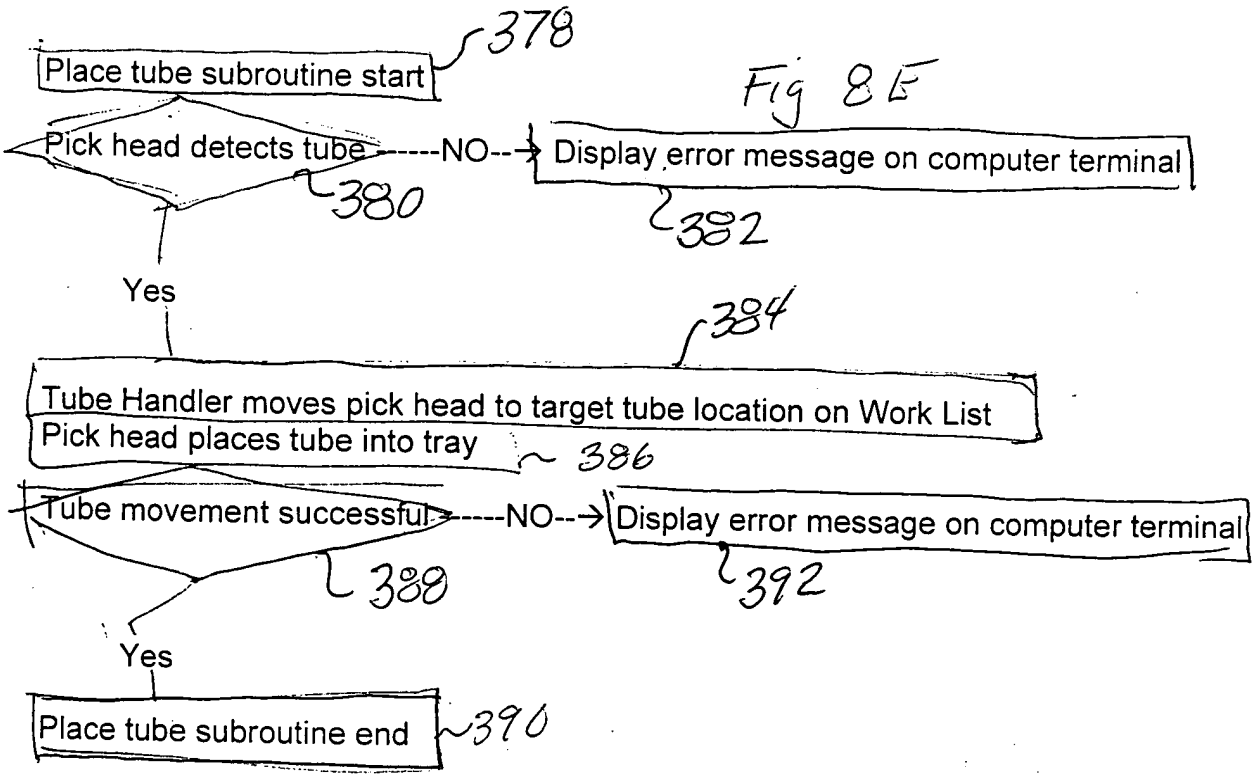
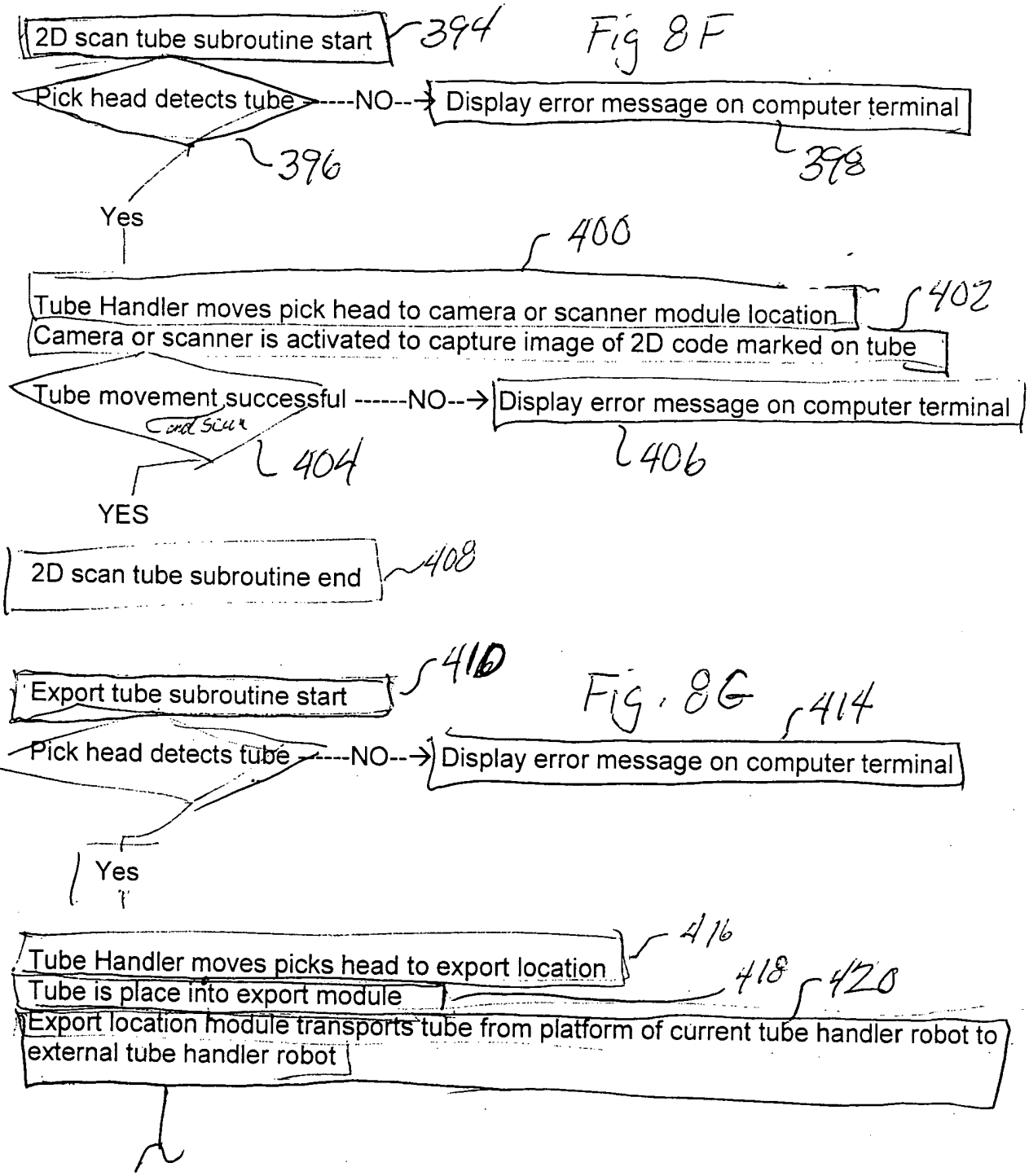

Place tube subroutine start
378
Pick head detects tube
NO
Display error message on computer terminal
380
382
Yes
384
Tube Handler moves pick head to target tube location on Work List
Pick head places tube into tray
386
Tube movement successful
NO
Display error message on computer terminal
388
392
Yes
Place tube subroutine end
390

Fig 8E


2D scan tube subroutine start
394
Fig 8F
Pick head detects tube
----NO-->
Display error message on computer terminal
396
398
Yes
400
Tube Handler moves pick head to camera or scanner module location
402
Camera or scanner is activated to capture image of 2D code marked on tube
Tube movement successful ------NO-->
Display error message on computer terminal
404
406
YES
2D scan tube subroutine end
408
Export tube subroutine start
410
Fig. 8G
414
Pick head detects tube
----NO-->
Display error message on computer terminal
Yes
416
Tube Handler moves picks head to export location
418
420
Tube is place into export module
Export location module transports tube from platform of current tube handler robot to external tube handler robot

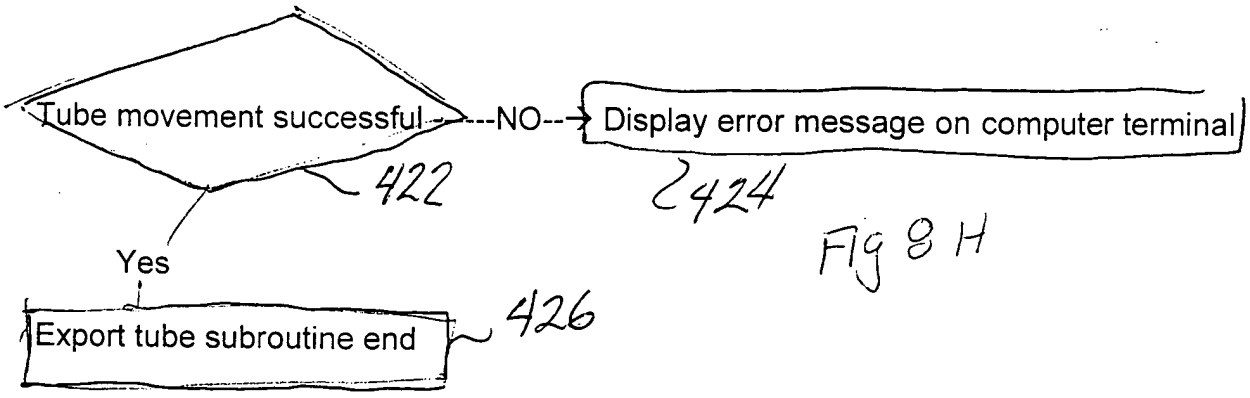

Tube movement successful
NO
Display error message on computer terminal
422
424
Yes
Export tube subroutine end
426

Fig 8H